What is claimed is:

1. A method of surface or cross-sectional processing and observation comprising :

a first step of processing at least one desired area in a surface of a sample to form a target surface or cross section; and

a second step of scanning the target surface or cross section with a probe of a scanning probe microscope and detecting a physical quantity produced between the probe and the target surface or cross section, thereby to observe the target surface or cross section.

2. The method of surface or cross-sectional processing and observation of claim 1, wherein said first step includes a substep of carrying out an etching process by irradiating the sample surface with a focused energy beam, thereby to expose the target surface or cross section.

3. The method of surface or cross-sectional processing and observation of claim 2, wherein the focused energy beam is a focused ion beam.

4. The method of surface or cross-sectional processing and observation of claim 3, wherein said first step includes a substep of decomposing an organic metal gas with the focused ion beam in a predetermined location of the sample to make an electrode and an interconnect after carrying out the etching process with the focused ion beam.

5. The method of surface or cross-sectional processing and observation of claim 1, wherein said first and second steps are carried out using a system for surface or cross-sectional processing and observation, said system having a unit for processing the surface of the sample to expose a target surface or cross section thereof, and a scanning probe microscope unit for observing the target surface or cross section.

6. A method of surface or cross-sectional processing and observation comprising:

a first step of processing at least one desired area in a surface of a sample to expose a target surface or cross section;

a second step of removing a damaged portion remaining in the exposed surface or cross section and then forming a stepped portion according to difference in material among layers constructing the exposed surface or cross section; and

a third step of observing the exposed surface or cross section with a scanning probe microscope.

7. The method of surface or cross-sectional processing and observation of claim 6, further comprising a step of finishing the exposed surface or cross section into a mirror face before the stepped portion is formed.

8. The method of surface or cross-sectional processing and observation of claim 2, wherein said step of exposing the target surface or cross section with the focused energy beam and said

step of observing the exposed surface or cross section with the probe are repeated sequentially.

9. A system for surface or cross-sectional processing and observation comprising:

a focused energy beam irradiating unit for processing a surface of a sample by irradiating a desired area in the sample surface with a focused energy beam while scanning the area to expose a target surface or cross section of the sample; and

a scanning probe microscope unit for scanning the target surface with a probe thereof and detecting a physical quantity produced between the probe and the target surface of the sample, thereby to observe the target surface or cross section of the sample.

10. The system for surface or cross-sectional processing and observation of claim 9, wherein the focused energy beam is a focused ion beam.

11. The system for surface or cross-sectional processing and observation of claim 9, further comprising an etching unit for etching the exposed surface or cross section.

12. The system for surface or cross-sectional processing and observation of claim 11, wherein said etching unit is an inert particle beam irradiating unit.

13. The system for surface or cross-sectional processing and observation of claim 11, wherein said etching unit is an etching gas blowing unit.

14. The system for surface or cross-sectional processing and observation of claim 11, wherein said etching unit is a laser beam irradiating unit.

15. The system for surface or cross-sectional processing and observation of claim 9, wherein the physical quantity is a physical quantity relating to an electric and magnetic solid state property of the sample such as an electrical conductivity, a dopant concentration, a dielectric constant, a potential, a leaking magnetic field, and a spin interaction of the sample.

16. The system for surface or cross-sectional processing and observation of claim 9, wherein the physical quantity is a physical quantity relating to a mechanical solid state property of the sample such as a hardness, a friction, an elasticoviscosity of the sample.

17. A system for surface or cross-sectional processing and observation comprising:

a focused energy beam irradiating unit for processing a surface of a sample by irradiating a desired area in the sample surface with a focused energy beam while scanning the area to expose a target surface or cross section of the sample; and

a scanning probe microscope unit for scanning the target surface with a probe thereof to carry out an additional processing and then detecting a physical quantity produced between the probe and the target surface or cross section, thereby to observe the target surface or cross section of the

sample.

18. The system for surface or cross-sectional processing and observation of claim 17, wherein the focused energy beam is a focused ion beam.

19. The system for surface or cross-sectional processing and observation of claim 17, further comprising an etching unit for etching the exposed surface or cross section.

20. The system for surface or cross-sectional processing and observation of claim 17, wherein said etching unit is an inert particle beam irradiating unit.

21. The system for surface or cross-sectional processing and observation of claim 17, wherein said etching unit is an etching gas blowing unit.

22. The system for surface or cross-sectional processing and observation of claim 17, wherein said etching unit is a laser beam irradiating unit.

23. The system for surface or cross-sectional processing and observation of claim 17, wherein the physical quantity is a physical quantity relating to an electric solid state property of the sample such as an electrical conductivity, a dopant concentration, a dielectric constant, a potential, a leaking magnetic field, and a spin interaction of the sample.

24. The system for surface or cross-sectional processing and observation of claim 17, wherein the physical quantity is a physical quantity relating to a mechanical solid state property

of the sample such as a hardness, a friction, an elasticoviscosity of the sample.

25. The system for surface or cross-sectional processing and observation of claim 17, wherein said unit for carrying out the additional processing is a cutting unit for cutting the sample surface with a diamond needle.

26. The system for surface or cross-sectional processing and observation of claim 17, wherein said unit for carrying out the additional processing applies a voltage between a conducting probe and the target surface or cross section to perform anodization, thereby to form an insulating layer on the target surface or cross section.

27. The system for surface or cross-sectional processing and observation of claim 9, further comprising a microscope unit for observing a position of the probe of said scanning probe microscope unit,

wherein the probe position is controlled based on observed information from said microscope unit.

28. The system for surface or cross-sectional processing and observation of claim 27, wherein said microscope unit is an optical microscope.

29. The system for surface or cross-sectional processing and observation of claim 27, wherein said microscope unit is a scanning electron microscope.

30. The system for surface or cross-sectional processing and

observation of claim 9, further comprising a switching unit for sequentially repeating the step of exposing a target surface or cross section of the sample with said focused energy beam irradiating unit and the step of observing the target surface or cross section with said scanning probe microscope.